Erosion of the edge transport barrier due to a magnetic curvature induced enhancement of transport associated with magnetic islands

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In tokamaks, the equilibrium temperature and pressure in presence of magnetic islands are characterized by a helical structure due to the periodic flattening of temperature and pressure on the islands [1]. The toroidal magnetic curvature couples pressure to the electrostatic potential, therefore providing a mechanism inducing also a helical structure of the equilibrium electrostatic potential. We present here an analytical and numerical study – in the frame of a fluid model – of the convective ExB transport associated with the pressure and potential equilibrium in presence of magnetic islands. It is found that this convective transport can be considerably high in the vicinity of a mean ExB shear flow. In edge turbulence simulations in presence of a tranport barrier induced by a strong ExB shear flow, this mechanism is found to lead to an erosion of the barrier and barrier relaxation oscillations observed in such simulations [2] are stabilized [3,4].

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